

REVISION OF AUSTRALASIAN *HYDROPHILUS* MULLER, 1764
(COLEOPTERA: HYDROPHILIDAE)

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The genus *Hydrophilus* Muller in Australia, New Guinea and New Caledonia is revised and descriptions given for each of the 11 species recognised, three of which are new (*H. novaeguineae*, *H. viridis* and *H. infrequens*). The following new synonymys are proposed: 1) *Hydrophilus picicornis* (Chevrolat, 1863) = *Hydrophilus gayndahensis* Macleay, 1871 = *Hydrophilus sabelliferus* Fairmaire, 1879 = *Stethoxus sabellifer* Bedel, 1891; 2) *Hydrophilus brevispina* Fairmaire, 1879 = *H. scissipalpus* Blackburn, 1901; 3) *Hydrophilus lorai* (Regimbart, 1902) = *Hydrous gebieni* Knisch, 1922a. A key to species is provided.

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Among the most prominent of Australian water beetles are the large black species of Hydrophilidae which belong to the world-wide genus *Hydrophilus* Muller 1764 (see Balfour-Browne 1941, and Pope 1985, for discussion of the use of this name for the genus). They are common in collections although they are seldom abundant in any one water body. An exception occasionally occurs in drying inland pools when both adults and larvae of some species can be found in large numbers.

The Australasian species have been revised and keys which include the Australasian species have been produced by Bedel (1891), and Regimbart (1902). But these studies were based on the examination of the relatively few specimens available in Europe at the time with the result that variation within species is underestimated. Conversely the lack of type material in Australia has led to mis-identifications being perpetuated. As a result material in Australian collections is usually poorly identified.

My studies have shown that there are seven endemic species in Australia, one in New Caledonia and two in New Guinea. In addition the common Indonesian species, *H. picicornis*, occurs widely in New Guinea and eastern Australia.

Hydrophilus is a world wide genus. Because of this I have made no attempt to think cladistically about the Australasian species. Suffice to say that phenotypically they fall into three groups. The largest group, characterised by a short stout sternal spine and little abdominal pubescence, comprises *H. latipalpus*, *H. pedipalpus*, *H. macronyx*, *H. australis*, *H. novaeguineae*, *H. albipes*, and *H. brevispina*. A second group, comprising *H. picicornis* and *H. lorai* and characterised by a very long sternal spine and completely pubescent sternal segments, is part of a large group of Asian species. The final group comprises two new species, *H. viridis* and *H. infrequens*, which have a short sternal spine and the sides of the abdominal sternae broadly pubescent; they are also smaller and stouter

than most *Hydrophilus*, resembling *Hydrobiomorpha* Blackburn in general shape.

Both adult and larval *Hydrophilus* are aquatic. The larvae are large, fleshy and carnivorous, living and hunting among the weeds at the edges and bottom of shallow ponds. Although frequently collected, no larvae of Australian species have yet been described.

Diagnostic characters of the genus *Hydrophilus* are; large (21-46 mm), prominent keel on underside produced backwards into a spine of varying length, apical margin of clypeus complete, prosternum deeply sulcate (hood-like) posteriorly to receive apex of sternal keel.

Specimens were examined from the following collections:

AM	Australian Museum, Sydney
ANIC	Australian National Insect Collection, CSIRO, Canberra
BMNH	British Museum (Natural History), London
CW	Private collection of author
MNHP	Museum National d'Histoire Naturelle, Paris
NMV	Museum of Victoria, Melbourne
NTM	Northern Territory Museum and Art Gallery, Darwin
EUQ	Entomology Department, University of Queensland
QDPI	Queensland Department of Primary Industries, Marceba
QM	Queensland Museum, Brisbane
SAMA	South Australian Museum, Adelaide
WAM	Western Australian Museum, Perth

SYSTEMATICS

KEY TO AUSTRALASIAN *HYDROPHILUS*

- 1 — Tip of sternal carina reaching beyond 2nd abdominal segment, abdominal segment

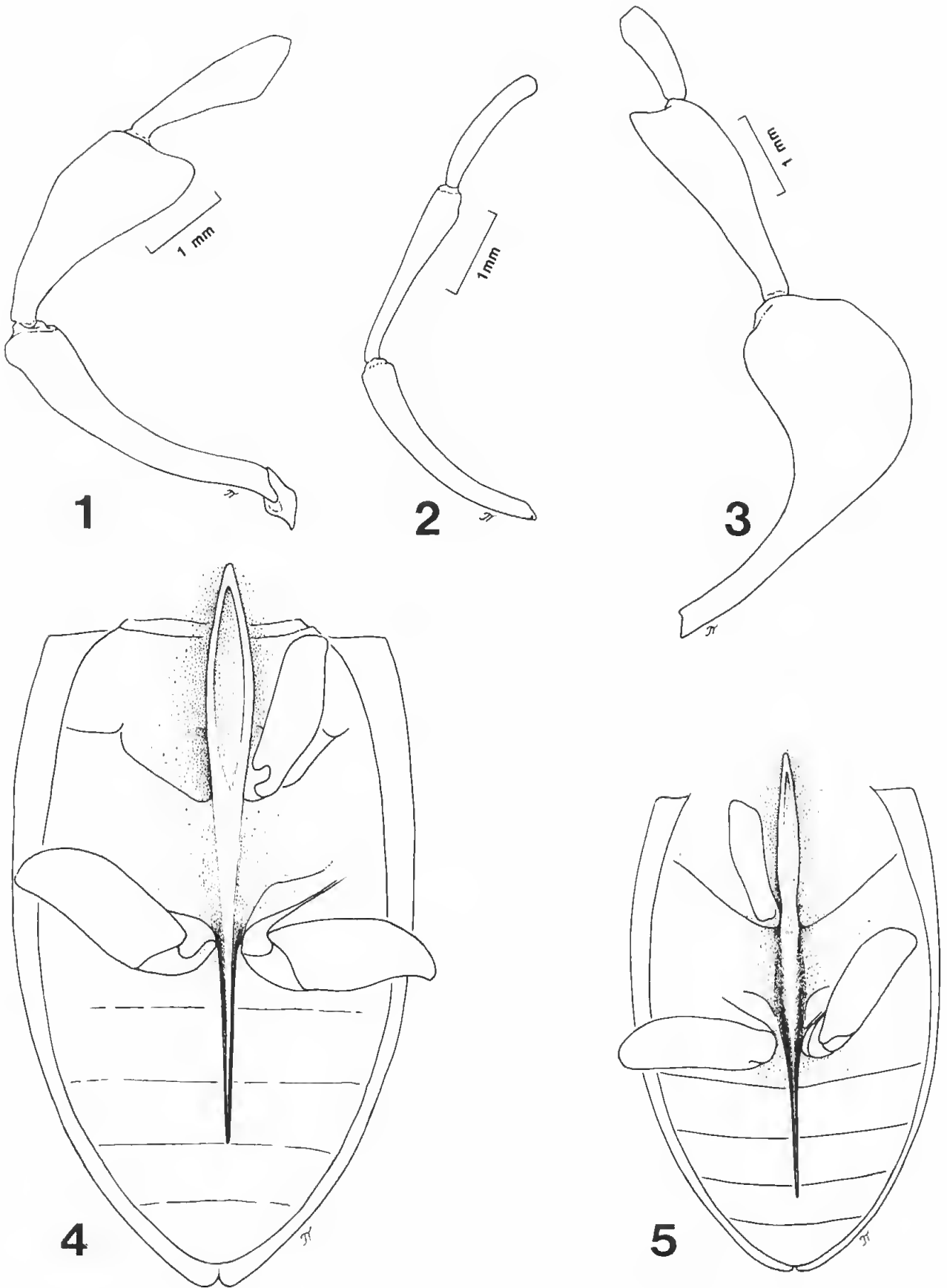
- entirely pubescent 2
- Tip of sternal carina not reaching beyond 2nd abdominal segment, abdominal segments with at least central portions non-pubescent 3
- 2(1) — Front portion of sternal carina wide, broadly sulcate (Fig. 4) *loriai* (Regimbart)
- Front portion of sternal carina narrow, narrowly sulcate (Fig. 5) *picicornis* (Chevrolat)
- 3(1) — Abdominal segments with all but central portions pubescent, small (18-25 mm), often olive-greenish 10
- Abdominal segments only pubescent in front angles, usually larger (20-46 mm) 4
- 4(3) — Tip of elytron distinctly spined, tip of sternal carina reaching to second abdominal segment, groove on front edge of pronotum reaching past level of inner edge of adjacent eye *australis* Montrouzier
- Tip of elytron rounded or weakly spined. Tip of sternal carina usually not reaching second abdominal segment, groove on front edge of pronotum variable ... 5
- 5(4) — Rugose area on front edge of 1st abdominal segment < 1/3 length of segment, metalemur robust 6
- Rugose area on front edge of 1st abdominal segment 1/2-3/4 length of segment 8
- 6(5) — Spine on underside of claw on protarsi of female in middle of claw, labial palpi thickened particularly in male, claws on protarsi of male enlarged, somewhat flattened, outer twice size of inner (Fig. 14) *novaeguinae* sp. nov.
- Spine on underside of claw of protarsi of female towards base of claw, labial palpi normal, outer claw on protarsi of male either grossly enlarged or thin and not flattened (Figs 10 & 16) 7
- 7(6) — Large (34-40 mm), groove along front edge of pronotum usually short, confined to extreme sides, protarsal claws of male greatly enlarged, spade-like, punctures on outer face of protibia sharply impressed *macronyx* (Regimbart)
- Small (27-35 mm), groove along front edge of pronotum usually reaching to level of inner border of eye, protarsal claws of male subequal but only slightly enlarged, punctures on outer face of protibia weak *brevispina* Fairmaire
- 8(4) — Smaller (21-30 mm), row of stout setae on outer face of protibia to about 1/2 length of tibia, male maxillary palpi of male simple *albipes* Castelnau
- Larger (30-46 mm), row of stout setae on outer face of protibia more than 2/3 length of tibia, male maxillary palpi of male enlarged 9
- 9(8) — Elytral striae relatively weak, sternal carina in male deeply grooved in front, flat in female, male antenna with first and second joint greatly expanded, maxillary palpi in male expanded *pedipalpus* (Bedel)
- Elytral striae well marked, particularly towards apex, sternal carina of male flat, in female with rounded downward extension at anterior apex, apex of elytron rounded or squared off, male antenna with moderately expanded second segment, maxillary palpi in male normal *latipalpus* Castelnau
- 10(3) — Small (18-21 mm), light olive green when dry, inner edges of rugose areas on abdominal segments 2 and 3 not adjacent, giving saw-toothed pattern *viridis* sp. nov.
- Large (23-25 mm), dark olive-green or reddish black when dry, inner edges of rugose areas on abdominal segments 2 and 3 approximately adjacent *infrequens* sp. nov.

***Hydrophilus macronyx* (Regimbart)**

Stethoxus macronyx Regimbart, 1902, p. 194.
Hydrous macronyx (Regimbart), Knisch, 1924, p. 249.

Description (number examined 11)

Length 34-39 mm. Oval. Dark olive-green to black, appendages lighter, reddish with well marked yellowish spots at side of each abdominal segment. Most of emarginate area on clypeus and membranous area of hind edge of abdominal segments 3-4 yellowish. Head with clypeus widely emarginate, 60-80 large punctures on frons area, densely covered with small punctures of two sizes, the smaller greatly predominating.



FIGURES 1-5. 1, maxillary palpus of male *H. latipalpus*; 2, *H. brevispina*; 3, ditto *H. pedipalpus*; 4, sternal keel of holotype of *H. loriae*; 5, ditto of *H. picicornis* (holotype of *H. sabelliferus*).

Pronotal punctures as on head, with a distinct groove around lateral edge, except near exterior hind angle, extending for only a short distance along front margin, some large punctures towards side. Elytron punctured as on head with four longitudinal rows of scattered large punctures in weak grooves, flanked on each side by row of very small punctures, traceable over whole elytron, a little more developed towards apex where they remain much smaller than punctures in main rows. Apex of elytron smoothly rounded. Sternal carina flat, with narrow groove on hind section, well marked short carina on surface between mesocoxae, spine short, blunt reaching to little more than $\frac{1}{2}$ way across first abdominal segment. Prosternal pillar wide, scoop-like with quite deep groove for reception of sternal carina. Lateral plate of mesosternum short, broad. Metatibia very broad, much larger than width of 2nd abdominal segment. Metacoxal plates not particularly narrow, about same width as 3rd abdominal segment. Pilose portion of 1st abdominal segment reaches about $\frac{1}{4}$ way across segment. Pilose portions of sides of other abdominal segments about $\frac{1}{6}$ width of segment. Hind edge of 1st abdominal segment with some well marked punctures. Abdominal segment weakly roofed in midline. Groove around edge of apical abdominal segment complete except for small portion at tip.

Female: protarsi not expanded [segment 5 > (2 > 3 - 4 - 1) in length].

Male: protarsi as in Fig. 16. Segment 5 massively expanded especially on bottom front edge, behind this flap is a row of stout setae; segment 4 and to a lesser degree segment 3 with elongate triangular expansion in same plane as segment 5 [5 > > (1 - 2 - 3 - 4) in length]. Outer claw massive, flatly expanded, almost as large as segment 5, inner claw greatly expanded, parallel-sided and flattened. 1st segment of labial palpi a little stouter than in female. Parameres narrow, bent, hooked at tip. Aedeagus short narrow, spermathecal opening very wide, beyond middle.

Type

Stethoxus mucrony? Regimbart. Rockhampton, in MNHP. One of two specimens used by Regimbart but not specifically designated as the Type. Herein designated lectotype.

Distribution (Fig. 17)

Known only from coastal regions of Northern Territory and Cape York.

Remarks

A large species readily recognised from the other large Australian species, *H. pedipalpis* and *H. latipalpis*, by the robust metafemurs and the greatly

enlarged spade-like claws on the male protarsi. Separated from *H. novaeguineae* by characters given under that species.

Additional localities

N.T. — Darwin AM, Oenpelli NMV, SAMA, NTM, QLD — Pt Denison AM, Tolga QDPI, Yirrkala AM.

Hydrophilus picicornis Chevrolat

Hydrophilus ruficornis Boisduval, 1835, name preoccupied by *Hydrophilus ruficornis* Klug, 1833), *Hydroporus picicornis* Chevrolat, 1863, p. 204; *Stethoxus picicornis* (Chevrolat), Bedel, 1891, p. 316; Kuwert, 1893, p. 91; Regimbart, 1902, p. 203; Knisch, 1922b, p. 2; Knisch, 1924, p. 256. *Hydrophilus gayndahensis* Macleay, 1871, p. 124, syn. nov.; Blackburn, 1901, p. 129. *Hydrous gayndahensis* (Macleay), Kuwert, 1893, p. 92; Knisch, 1924, p. 248. *Hydrophilus sabelliferus* Fairmaire, 1879, p. 80, syn. nov. *Hydrous sabelliferus* (Fairmaire), Knisch, 1924, p. 248. *Stethoxus sabellifer* Bedel, 1891, p. 316, syn. nov. (unjustified emendation of *sabelliferus* Fairmaire); Regimbart, 1902, p. 204. *Hydrous sabellifer* (Bedel), Knisch, 1924, p. 248.

Description (number examined 233)

Length 21-32 cm. Elongate oval. Dark olive green to black, appendages of head and a diffuse spot laterally on each abdominal segment reddish-brown. Head with clypeus relatively weakly emarginate; 40-60 large punctures in frons area, densely punctured with small punctures of two sizes, the smaller more numerous and minute. Pronotum punctured as on head, with a distinct groove around lateral edge, except for hind angle, and along front to about $\frac{1}{4}$ width of pronotum on either side; a few very large punctures towards sides. Elytron with very fine reticulation but virtually lacking punctures other than the following except for some very small ones towards apex. Four distinct rows of even punctures, the 1st, 2nd and 4th, to a lesser degree, with punctures close together, the 3rd with only a few sparse punctures. Each row flanked on each side by a row of very small punctures only visible in certain lights. Apex of elytron truncated with or without a small blunt spine on sutural angle. Sternal carina thin, weakly and widely grooved in front portion, hind portion with slight thin groove, spine greatly elongated, sharp, reaching to hind $\frac{1}{2}$ of 3rd segment with tendency to bend downwards towards tip. Prosternal pillar squat, deeply and narrowly grooved for reception of sternal carina. Metacoxal plate a little narrower than metatibia. Metatibia

about width of 2nd abdominal segment. Pilose area on underside completely covering abdominal segments, occasionally some thicker golden hairs in midline.

Female: protarsi not expanded [segment $5 > 2 > (1 - 3 > 4)$ in length].

Male: protarsi as in Fig. 9. Fifth segment weakly expanded almost equal in length to 2nd. Claws narrow, curved, outer considerably larger than inner [segment $5 < (2 > 3 > 4 = 1)$ in length]. Parameres elongate, thin, aedeagus thick at base, rapidly tapering at tip. Spermathecal duct opening near tip.

Types

Hydrophilus gayndahensis Macleay. There are two specimens in the ANIC (on permanent loan from the Macleay Museum) from Gayndah labelled as syntypes. One is a male in good condition, the other has lost most of its tarsi. In addition there are two specimens in AM each labelled 'Holotype'. Presumably these are the specimens designated by McKeown 1948. One, without locality and labelled only 'K19395' is a specimen of *H. albipes*, the other with the same number is labelled '*Hydrophilus gayndahensis* Gayndah' and is a specimen of *H. gayndahensis*. I feel reasonably certain that the true holotype is among these specimens and herein designate the specimen labelled '*Hydrophilus gayndahensis* Gayndah' in AM as the lectotype and the Macleay Museum specimens as paralectotypes.

Hydroporus picicornis Chevrolat. Not located. Type locality given as Cuba by Chevrolat but this locality has been discounted by most authors (cf. Bedel 1891; Knisch 1924).

Hydrophilus ruficornis Boisduval. Not located. Type locality, 'Nouvelle Hollande'. It is possible that this is the same insect as *H. picicornis*. It is however an occupied name having been used in 1833 by Klug for a Madagascan species.

Hydrophilus sabelliferus Fairmaire, male, labelled 'Hydrophil sabelliferus Fairm L. Viti-leon' from collection Leon Fairmaire 1906, in MNHP. I herein designate it lectotype since it is unclear whether this is a holotype or a syntype. Synonymy based on examination of types and description of *H. picicornis*.

Remarks

Readily recognisable from all other Australasian *Hydrophilus*, except *H. lorjai*, by long sternal carina, which reaches $\frac{1}{2}$ length of abdomen, and by the abdominal segments completely covered by pilosity; separated from *H. lorjai* by characters given under that species.

Distribution

Coastal Australia from the Kimberly to northern New South Wales (Fig. 17), New Guinea and other islands to north of Australia.

A widespread species through Indonesia, New Guinea, Pacific Islands and northern Australia. I have not seriously studied the northern or western geographic boundaries of this species but consider specimens seen from Vietnam and the Philippines should be included. There is a north-south trend in size with specimens from Sulawesi and the Philippines averaging considerably larger than those from Australia.

Additional Localities

W.A. — Drysdale R. ANIC, Mitchell Plateau ANIC, QLD — Ayr ANIC, Biggenden ANIC, Brisbane ANIC, BMNH, Bundaberg ANIC, Cairns ANIC, Cooktown QDPI, Edungalba ANIC, Ingham ANIC, Innisfail QDPI, Iron Range ANIC, Lamington Nat. Pk ANIC, Marreeba QDPI, Mt Spec ANIC, Nambour ANIC, Ravenshoe ANIC, Rockhampton ANIC, AM, Samford ANIC, Tolga QDPI, Tully ANIC, N.T. — Adelaide R. NTM, Cobourg Pen. ANIC, Daly River Crossing ANIC, Daly R. SAMA, Darwin ANIC, Gove NMV, Humpty Doo QDPI, Jabiru NTM, Koongarra ANIC, Mt Cahill ANIC, Nabarlek Dam ANIC, Nourlangie ANIC, NMV, 120° 34'S 131° 18'E NTM, N.S.W. — Bonville ANIC, Huka AM, Kempsey ANIC, SAMA, Lismore AM, Macleay R. ANIC, Pt Macquarie AM, Repton AM, A.C.T. — Black Mt ANIC. Other — Fiji BMNH, Finestierre Mts (P.N.G.) BMNH, Java SAMA, 90 km W Lae (P.N.G.) BMNH, Mimika R. (P.N.G.) BMNH, Pt Moresby (P.N.G.) BMNH, Pt Yiperres (P.N.G.) BMNH, Sulawesi BMNH.

Hydrophilus lorjai (Regimbart)

Stethoxus lorjai Regimbart, 1902, p. 193.

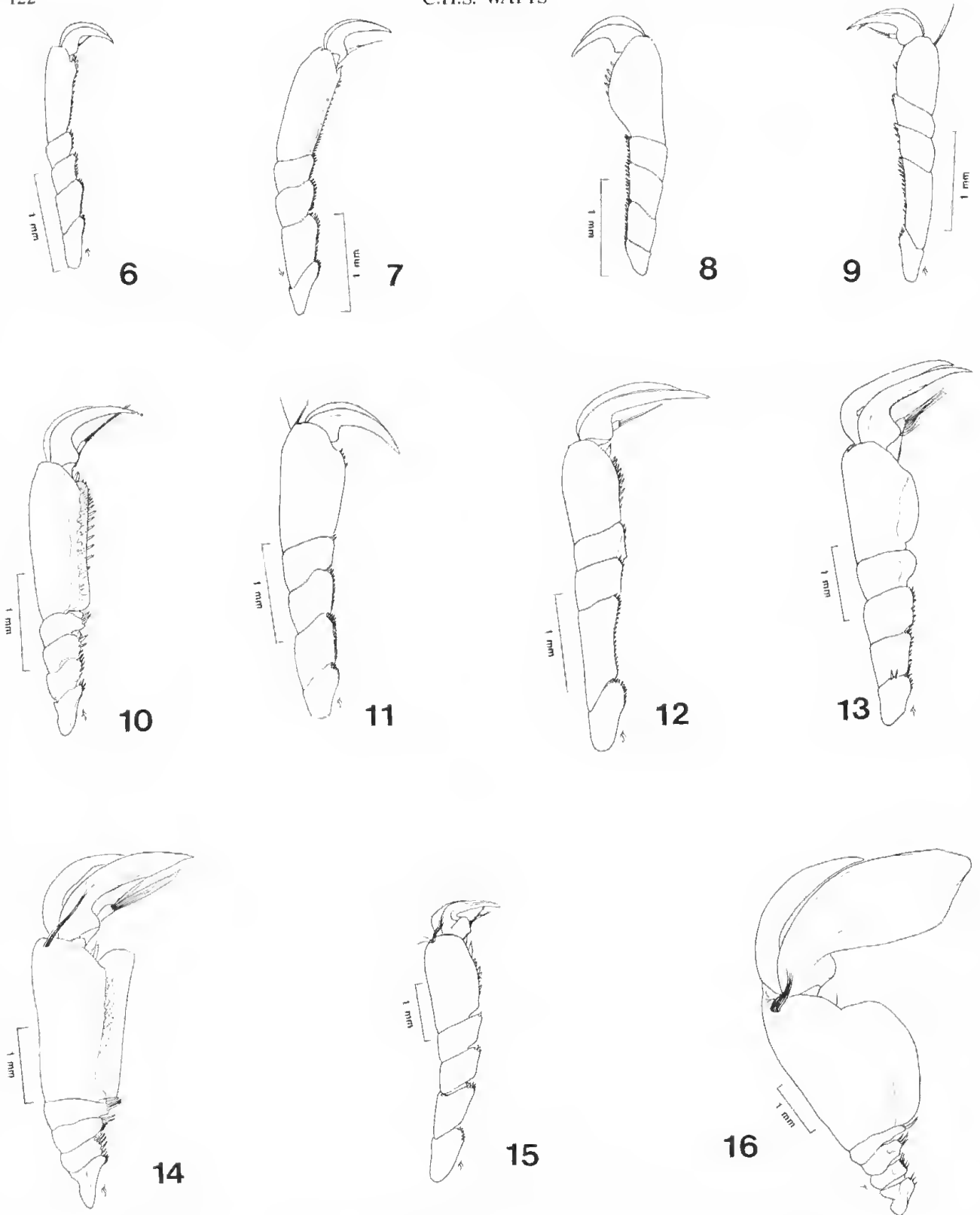
Hydrous gebieni Knisch, 1922, p. 108, 39ff. nov.

Description (number examined 9)

Length 31–33 mm. As for *H. picicornis* except as follows. Generally larger. Apex of elytron beakcut towards sutural edge which usually has a small but well-marked spine. Sternal carina broad in front, narrowing behind, mesosternal portion broadly and deeply sulcate (Fig. 4) whereas in *H. picicornis* the carina is narrower and has a much weaker groove (Fig. 5). Apical portion of sternal carina tending to bend upwards so as to remain equidistant from abdomen whereas in *H. picicornis* it is almost invariably straight or bent downwards away from the abdomen. The tips of the parameres are more swollen in this species.

Types

Stethoxus lorjai Regimbart. Holotype male labelled 'L. Loria/Muso Civ Genova' with handwritten label 'lorjai Reg' in MNHP. I herein design-



FIGURES 6-16. Protarsus of male: 6, *H. viridis*; 7, *H. infrequens*; 8, *H. albipes*; 9, *H. picicornis*; 10, *H. brevispina*; 11, *H. australis*; 12, *H. lorae*; 13, *H. pedipalpus*; 14, *H. novaeguineae*; 15, ditto *H. latipalpus*; 16, *H. macronyz*.

nate it lectotype since it is unclear whether this is a holotype or a syntype.

Hydrous gebieni Knisch. Not located (not in BMNH, MNHP, or Brussels). Synonymy based on examination of type and description of *H. gebieni*.

Distribution

New Guinea; L. Loria, Amboin (ANIC), Lac and Humboldt Bay District, Irian Jaya (in BMNH), Kaiserin Augusta River (type locality of *H. gebieni*). The four specimens from Amboin, New

Guinea, (Col. H. Ohlms 16/10/74) agree well with the type except that they are noticeably broader.

Remarks

The differences between *H. lorlai* and *H. picicornis* are slight and at first I considered the former only a subspecies of *H. picicornis*. However the three Amboin specimens were collected together with typical *H. picicornis* which virtually rules out subspecies. This and the lack of specimens with intermediate characters, particularly the broadly sulcate sternal carina, have persuaded me to treat *H. lorlai* as a good species.

Hydrophilus australis Montrouzier

Hydrophilus australis Montrouzier, 1860, p. 248; Fauvel, 1883, p. 351. *Stethoxus australis* (Montrouzier), Fauvel, 1903, p. 351; Bedel, 1891, p. 317; Kuwert, 1893, p. 87; Regimbart, 1902, p. 207. *Hydrous australis* (Montrouzier), Knisch, 1924, p. 247.

Description (number examined 26)

Length 32–36 mm. Oval, dark olive-green to black. Appendages of head, a well marked spot at sides of each abdominal segment, the membranous hind edge of abdominal segments 2–4 and hind portion of emarginate area on clypeus reddish-yellow. Head with clypeus deeply and widely emarginate, 40–60 large punctures on frons area, densely covered with extremely small punctures with scattered larger ones. Pronotum punctured as on head, with a distinct groove around lateral edge, except for hind angle, and along front margin to about $\frac{1}{2}$ way to centre, some large punctures towards sides. Elytron punctured as on head with a minute reticulation, four longitudinal rows of rather sparse scattered large punctures, each row flanked on either side by a row of small punctures, towards apex these become more noticeable than main rows of punctures, towards front virtually untraceable. Apex of elytron rounded, with well-marked small spine. Sternal carina quite broad particularly towards front where it is deeply and widely grooved, weakly but sharply grooved towards rear, spine sharp, reaching to or just beyond base of 2nd abdominal segment. Posternal pillar pointed, deeply grooved for receiving end of sternal carina. Lateral plate of mesosternum relatively long and narrow. Metatibia relatively narrow, equal to or a little less than width of second abdominal segment. Metacoxal plate narrow, a little narrower than metatibia. Pilose portion of 1st abdominal segment reduced to narrow band along front margin, that on other abdominal segments

about $\frac{1}{4}$ width of segments, both virtually lacking in setae. Abdominal segments 2–5 with broad, rather ill-defined roofing, groove around edge of apical abdominal segment lacking in apical $\frac{1}{4}$.

Female: protarsi not expanded [segment $5 < (2 > 3) = 4 < 1$] in length].

Male: protarsi as in Fig. 11. Claws thin, curved, subequal [segment $5 < (2 > 3 = 4 < 1)$ in length]. Parameres flat, aedeagus relatively short, opening of spermathecal duct beyond middle.

Type

A specimen of unknown sex, labelled 'Hydrophilus Australis Montr. N. Caledonie' in MNHP from Coll. L. Bedel, 1922. The specimen lacks palps and protarsi. Since it is unclear whether this is a holotype or syntype I herein designate it as lectotype.

Distribution

New Caledonia.

Remarks

Separated from the other large *Hydrophilus* of the region by having the tips of the elytra distinctly spined and the spine of the sternal carina reaching at least to the second abdominal segment.

Hydrophilus brevispina Fairmaire

Hydrophilus brevispina Fairmaire, 1879, p. 80; Fauvel, 1883, p. 351. *Stethoxus brevispina* (Fairmaire), Bedel, 1891, p. 317; Regimbart, 1902, p. 208. *Hydrous brevissimus* Kuwert, 1893, p. 87, either a mistake or unjustified emendation of *Hydrous brevispina* Fairmaire, 1879; Blackburn, 1896, p. 225. *Hydrous brevispina* (Fairmaire), Knisch, 1924, p. 247. *Hydrophilus scissipalpis* Blackburn, 1901, p. 128, syn. nov. *Hydrous scissipalpis* (Blackburn), Knisch, 1924, p. 257.

Description (number examined 219)

Length 27–35 mm. Elongate oval. Dark olive-green, appendages reddish, an orange-yellow patch in middle of each ventral abdominal segment at sides. Head with clypeus deeply and widely elongate, exposed portion yellowish, 60–80 large punctures in frons area, densely covered with much smaller punctures of two sizes, smallest very small but well-marked. Pronotum punctured on head, with distinct groove around lateral edge and for about $\frac{3}{4}$ way along front margin, some large punctures inwards of this groove in front angles. Elytron punctured as on head with four longitudinal rows of scattered punctures in weak depressions, flanked on either side by a row of extremely small punctures

only noticeable in some lights; apex of elytron bluntly rounded, not truncated. Sternal carina narrow, flat in front, weakly but sharply grooved in hind quarter, a short sharp ridge in midline at rear of mesosternal portion in some, spine short, blunt reaching to about $\frac{1}{2}$ way across first abdominal sternite. Prosternal pillar thin, pointed, open with little or no hood over groove for sternal carina. Lateral plate of mesosternum relatively short and broad. Metatibia relatively broad, a little larger than width of 2nd abdominal segment. Pilose portion of 1st abdominal segment to about $\frac{1}{6}$ width. Rugose portions of other abdominal segments reduced to small patches in front angles at sides about $\frac{1}{4}$ width of segment. Abdominal segments weakly roofed in midline. Groove around edge of apical abdominal segment complete or only broken for short distance at apex. Metacoxal lobe narrow, narrower than width of metatibia.

Female: protarsi not expanded [segment 5 - (2 > 3 > 4 > 1) in length], claws subequal with large subbasal tooth.

Male: profarsi as in Fig. 10. Segment 5 expanded with membrane like flap on bottom front margin [segment 5 > (1 - 2 - 3 - 4) in length]. Claws elongate, outer larger and thinner than inner. Second joint of maxillary palpi expanded slightly triangularly inwards near apex. Aedeagus thin, weakly expanded at tip. Parameres weakly hooked on outside of tip. Opening of spermathecal duct midway along aedeagus.

Types

Hydrophilus brevispina Fairmaire. Not located. Type locality, Brisbane.

Hydrophilus scissipalpis Blackburn, Holotype, '6971 Central Australia', BMNH. Synonym based on description and examination of type.

Distribution (Fig. 17)

Widespread throughout Australia except for the south-east and Tasmania and possibly also the south-west.

H. brevispina is often confused with *H. albipes* but is readily separated from that species by its much more robust metafemora as well as characters given in the key. Both species are relatively common and are widely sympatric. However *H. brevispina* occurs much further north than *H. albipes*. *H. albipes* is common in south-eastern Australia, Tasmania and the south-west where *H. brevispina* is absent.

Remarks

H. brevispina is moderate-sized, stout, dark olive-green species readily recognized by the

complete groove on the apical abdominal segment, small amount of pilosity on abdominal segments, stout metafemur, narrow posternal pillar and relatively large marginal groove along front edge of pronotum.

Additional Localities

VIC. — Ouyen ANIC, Wyperfeld ANIC, 73 km W.N.S.W. — Armidale ANIC, 32 km SSW Bourke SAMA, Byrook ANIC, Deniliquin NMV, Dubbo NMV, Glen Innes AM, Grafton ANIC, Milparinka SAMA, Mitchell AM, Mootwingee ANIC NMV, Moree AM, Mt Hope ANIC, Paroo R. BMNH, Parkes AM, Singleton ANIC, Tamworth ANIC, Tibooburra ANIC, Tooraweenah ANIC, Trangie ANIC, Wanaaring ANIC, Willandra Bridge ANIC, Wyvern Bringagee AM, QLD. — Alexandria Stn AM, 49 km SW Arrilalah ANIC, Ayr QDPI, Bedourie ANIC, 138 km NW Bedourie AM, Biggenden ANIC, Bowen SAMA, Burnett R. ANIC, Calliope R. ANIC, Camooweal ANIC, Chillagoe ANIC, Coopers Creek BMNH, Cunnamulla ANIC AM SAMA, Durham Downs ANIC, Eidsvold AM, Emerald ANIC, Funnel Ck ANIC, Glenormiston ANIC, Goondiwindi ANIC, 48 km ESE Hungerford ANIC, 35 km SE Ilfracombe ANIC, Lake Dynevor ANIC, Lawn Hill ANIC, Longreach ANIC, Mackay AM, Mareeba QDPI, Mitchell SAMA, Mt Spec ANIC, Noccundra ANIC, Nockatunga ANIC, Normanton SAMA, Rockhampton ANIC SAMA, 40 mile Scrub ANIC, Silver Plains ANIC, Somerset Dam ANIC, Tanbar ANIC, Taroom ANIC, Thylongra ANIC, 10 km E Tjabulka AM, Townsville ANIC BMNH QDPI, 90 m S Urandangie ANIC, Warwick AM, Wilson R. ANIC, Yeppoon ANIC (BMNH). S.A. — Anna Ck Stn SAMA, 26 km NW Alberga RS SAMA, Blinman SAMA, Cadelga O.S. SAMA, Callabonna SAMA, Cameron Corner SAMA, Coward Spr. 40 km E Frome Downs SAMA, Hay R. Simpson Desert SAMA, Iron Duke SAMA, Kalamurina Stn SAMA, Lake George ANIC, Mabel Ck Stn SAMA, 28 km SSW Mabel Ck Stn SAMA, Marree SAMA, Mt Serle SAMA, Oodnadatta NMV SAMA, Strathearn HS SAMA, Stuart Ck Stn SAMA, N.T. — Alexandria BMNH, Alice Springs SAMA NTM, 1 km N Barrow Ck NTM, Borroloola ANIC, Glenormiston Stn SAMA, Hermannsburg BMNH, Kings Canyon NTM, McArthur R. ANIC, 19 km SW Mt Cahill ANIC, Simpson Gap NTM SAMA, 41° S 133° 25' E NTM, 24° 05' S 134° 00' E NTM, Yuendumu ANIC W.A. — Ashburton R. WAM, Barradale ANIC, Cape River HS ANIC, Cape Bertholet ANIC, Carnarvon-Exmouth Rd BMNH, Kunururra ANIC, Minilya R. ANIC, Prairie Down Stn SAMA, Wurunga ANIC.

Hydrophilus albipes Castelnau

Hydrophilus albipes Castelnau, 1840, p. 51. *Stethoxus albipes* (Castelnau), Bedel, 1891, p. 317; Regimbart, 1902, p. 207. *Hydrophilus albipes* Castelnau, Blackburn, 1896, p. 255. *Hydrous albipes* (Castelnau), Kuwert, 1893, p. 87; Knisch, 1924, p. 245.

Description (number examined 487)

Length 20–31 mm. Narrowly oval. Black, appendages reddish, diffuse reddish patches at sides of abdominal segments. Head with clypeus quite deeply and widely emarginate, exposed portion yellow only in hind half, 60–80 large punctures on frons, densely covered with small but well-marked punctures of two main sizes, the large less numerous than the smaller. Pronotum punctured as on head, with distinct groove around lateral sides and a short distance along front margin; some large punctures inward of this groove in front angles. Elytral punctures as on head, with four longitudinal rows of scattered punctures, flanked on either side by a row of extremely small punctures only visible anteriorly in certain lights but well-marked at apex. Apex of elytron rounded, with very small spine in extreme apex. Sternal carina thin, a little broader in area of mesosternum, flat except for weak sharp groove towards rear, spine short blunt reaching to about $\frac{1}{3}$ width of first abdominal segment. Prosternal pillar broad, bluntly pointed, groove for sternal carina reaching only about $\frac{1}{2}$ depth of pillar. Lateral plate of mesosternum relatively narrow. Metatibia relatively narrow, a little narrower than 2nd abdominal segment. Rugose portion of first abdominal segment covering all but narrow area along hind edge, hind angles and midline of segment, lateral portions on other abdominal segments about $\frac{1}{3}$ width of segment. Anterior abdominal segment quite strongly roofed in midline. Groove around edge of apical abdominal segment lacking in apical $\frac{1}{4}$. Coxal lobe narrow, narrower than metatibia.

Female: protarsi not expanded [segment 5 < (2 > 3 > 4 > 1) in length], claws with a large basal tooth.

Male: protarsi as in Fig. 8 [segment 5 expanded, particularly on bottom front margin [segment 5 < (2 = 3 > 4 > 1) in length]. Claws stout, inner a bit stouter and a little shorter than outer. Palpi normal. Aedeagus and paramere long and thin. Opening of spermathecal duct $\frac{1}{3}$ way along aedeagus.

Type

Hydrophilus albipes Castelnau. Not located. Type locality given as New Holland.

Distribution (Fig. 17)

A widespread southern species.

Remarks

H. albipes is a small, narrow, black species separated from other *Hydrophilus* by its small size, short sternal carina, incomplete groove around edge of apical abdominal segment, slim metafemur, and with row of setae on outer face of protibia only about $\frac{1}{2}$ length of tibia.

Additional Localities

N.S.W. — Balranald ANIC, Bathurst AM, Binnaway AM, Broken Hill SAMA, Canberra ANIC, Corowa ANIC, Deniliquin ANIC, Girilambone ANIC, Gundaroo ANIC, Hay ANIC, Louth AM, Marrabui BMNH, 24 km ENE Broken Hill AM, 5 m S Mendooran AM, Mitchell AM, Moree MM, Mt Moodie ANIC, Mudgee ANIC, Rylstone SAMA, Silverton ANIC, Singleton ANIC, Trangie ANIC, Uralla ANIC, Wagga Wagga ANIC, Willandra Bend ANIC, Yagobie ANIC, Yanco AM. VIC. — Benambra AM, Bendigo ANIC, Bundoo Rng. AM, Euroa NMV, Gclibrand NMV, Grampians ANIC AM, Halls Gap SAMA, Hattah lakes ANIC SAMA, Kerang AM, Kulkyne Forest ANIC, Lady Julia Percy I. AM, Little Desert ANIC, Melbourne BMNH, Frankston AM, Melbourne NMV BMNH SAMA, Moe ANIC, Moyston ANIC, Otways SAMA, Sealake ANIC, Terang ANIC, Warragul ANIC, Warranbool NMV, Wyperfield Nat. Pk ANIC, Yanac ANIC. S.A. — Adelaide BMNH SAMA, Beachport SAMA, 23 m NE Billa Kalina HS SAMA, Bool Lagoon SAMA, Coward Sp. SAMA, Etadunna WAM, Fairview Park Con. Res. SAMA, 40 km E Frome Downs SAMA, Frome R. Crossing SAMA, Kangaroo I. AM, Koonamore Stn SAMA, Lake Callabonna AM SAMA, Lake Eyre SAMA, Monarto SAMA, Mungerannie Stn SAMA, Mylor SAMA, Nangwarry SAMA, Naracoorte SAMA, Parachilna SAMA, Penola SAMA, Taratap Stn SAMA, Waitpinga SAMA, Whyalla NMV, Yunta SAMA. TAS. — Carlton ANIC, Hobart SAMA, Launceston NMV SAMA, Longford ANIC. W.A. — Albany WAM, Armadale WAM, Boxwood Hill ANIC, Bullsbrook WAM, Cape Arid ANIC, Cervantes ANIC, Claremont ANIC, Culcurdool WAM, Darling Rng. AM, Esperance ANIC, 63 km E Esperance ANIC, Forrestdale WAM, Geraldton ANIC, Guilderton ANIC, Helena R. WAM, Hoptown ANIC, Kalbarri Nat. Pk ANIC, Mt Arid ANIC, Point Peron WAM, Preston R. ANIC, Thomas R. ANIC, 10 m SW Three Springs SAMA, Wanneroo WAM, Wilga ANIC.



FIGURE 17. Distribution maps of Australian *Hydrophilus* species.

Hydrophilus infrequens sp. nov.*Description* (number examined 3)

Length 24–25 mm. Oval. Upper surface, when dry, varying from dark with olive-green tinges to dark with reddish tinges, elytra with vague dark strips in serial puncture lines, at higher magnification elytra covered with thin black interdigitating lines more noticeable in greenish individuals. Ventral surface black, appendages of head and lateral patches on abdominal segments reddish. Head shallowly emarginate for about half width of frons, basal half of exposed portion yellowish, front portion black. About 60 large punctures lying in two V-shaped weak grooves on frons, which is densely covered with small but well-marked punctures predominantly of two sizes with the smaller more numerous. A well-separated pair of pits bearing long setae in middle of frons. Pronotum punctured as on head, with a distinct groove along lateral edges and along front edge for a very short distance, a few groups of 2 large punctures towards sides. Elytron with lightly impressed line reticulation and scattered very small punctures of variable sizes, also four loose rows of large punctures flanked on each side by a row of punctures which are subobsolete towards front but as large as serial punctures at apex. Band of closely placed but scattered punctures along lateral edge of elytron. Apex of elytron rounded. Sternal carina, flat, broad, particularly mesosternal portion, constricted between mesocoxae and narrowing at both front and rear end, spine blunt reaching a little over $\frac{1}{2}$ width of first abdominal segment. Prosternal pillar pointed, groove to receive sternal carina narrow about $\frac{1}{2}$ width of pillar in depth. Lateral plate of mesosternum narrow, relatively long, metacoxal plate narrow, both narrower than width of metafemur which is about same width as second abdominal segment. Pilose area on underside covers all abdominal segments except for approximately the central half of segments 2–5.

Female: protarsi not expanded, protarsal claw with small spine on underside about middle [segment 5 < (2 > 3 = 4 = 1) in length].

Male: protarsi as in Fig. 7. Segments a little thicker than in female and slightly expanded on front bottom edge. Claws simple, evenly curved along outer edge. Segment 5 = (2 > 3 = 4 = 1) in length. Parameres short, broad. Aedeagus with spermathecal duct opening near tip.

Types

Holotype: ♂ 28°52'S 153°03'E Casino, N.S.W., 12.XII.1971, Key and Balderson, 'at light' in ANIC. Paratypes: 1, ♂ 'Brisbane 1/30' J.G. Brooks Bequest 1976; 1, ♂, '1 ml N of Brunswick Heads N.S.W. 1 Jan 1973 R.I. Kohout', in ANIC.

Distribution (Fig. 17)

Known only from the type localities on the east coast near the New South Wales/Queensland border.

Remarks

This and *H. viridis* are closely related and separated from other Australasian *Hydrophilus* by the extensive lateral pilosity on the abdominal segments and the presence of a pair of setae bearing pits or a tight group of large punctures on the front of the frons. *H. infrequens* is separated from *H. viridis* by its generally larger, darker and more rounded shape, stronger punctation on upper surfaces, slight difference in pilose area on underside, broader tip to the parameres, spermathecal duct opening at end of aedeagus rather than further down, and slightly more robust male protarsi.

Hydrophilus viridis sp. nov.*Description* (number examined 4)

Length 18–21 mm. Elongate oval. Olive-green, extreme edges of elytron, pronotum and scutellum black, two small black spots at rear of pronotum. Underside black, legs reddish, appendages on head yellow-brown. Head deeply but rather narrowly emarginated, basal half of exposed portion yellow-brown, front portion black, 70–90 large punctures lying in two V-shaped weak grooves on frons, a well-separated pair of small pits in middle of frons with large setae emerging from them, densely covered with small but well-marked punctures of varying sizes. Pronotum punctured as on head, with distinct groove around lateral edge and along front edge for a short distance, a few groups of large punctures towards sides. Elytron with fine reticulation and scattered minute punctures, also four loose rows of large punctures flanked on each side by a row of very small punctures more distinct towards apex. Apex of elytron rounded. Sternal carina wide, constricted between mesocoxae and narrowing at both front and rear, spine blunt, reaching to beginning of second abdominal segment. Prosternal pillar pointed, narrowly but not deeply grooved for reception of sternal carina. Lateral plate of mesosternum narrow, relatively long, metacoxal plate narrow, both narrower than metafemur which is about width of 2nd abdominal segment. Pilose area of underside covers all abdominal segments except for central $\frac{1}{2}$ of segments 2–5.

Male: protarsi as in Fig. 6. Segments not expanded, claws simple, sharply bent near base [segment 5 > (2 > 3 = 4 = 1) in length]. Parameres short, broad. Aedeagus with spermathecal duct opening around middle.

Distribution (Fig. 17)

Known only from the type localities in coastal northern Queensland.

Types

Holotype: ♂ '14m. S. Coen, N.Q. 780' 18.5.72. J.G. Brooks' 'At light' 'B 73 of 82' in ANIC. Paratypes: 1, ♂ 'Ingham Qld 24.2.1960 K.L. Harley' in ANIC; 1, ♂ 'Townsville Qld. 19.4.63 C.W.' in CW; 1, ♀ 'Atherton 14.XII.58. G. Evershank' in QM.

Remarks

A rare species with a pronounced olive-green colour when dry. Separated from the closely related *H. infrequens* by characters given under that species.

Hydrophilus novaeguineae sp. nov.*Description* (number examined 6)

Length 32-43 mm. Elongate oval. Black, appendages of head and small round patches at sides of abdominal segments dark-reddish. Head with clypeus deeply emarginate for about half width of clypeus, exposed portion dark reddish in front half, 60-80 large punctures on frons in addition to a dense patch inwards from each eye, moderately densely covered by small but variably-sized punctures. Pronotum punctured as on head, with a distinct groove around lateral edge and a short distance along front edge, scattered large punctures towards sides. Elytron punctured as on head with four longitudinal rows of scattered well-impressed setae-bearing punctures each flanked by a row of very small punctures, virtually untraceable towards front, and a single line of close punctures adjacent to lateral edge. Apex of elytron rounded without spine. Sternal carina slightly swollen, sharply but weakly grooved in final section, widely but very shallowly grooved in front section, hind portion of front section with distinct midline carina, hind end of front section slightly above from end of rear section; spine blunt and short, reaching a little more than halfway across first abdominal segment. Prosternal pillar sharply pointed only shallowly grooved to take sternal carina. Lateral plate of mesosternum short, relatively broad. Metafemur stout, noticeably wider than 2nd abdominal segment, metacoxal plate narrower than metafemur. Pilose portion of 1st abdominal segment covering about 1/2 of width of segment, that on sides of other segments about 1/3 of width of segments. Abdominal segments 1-4 weakly roofed in midline. Groove around edge of apical abdominal segment absent in apical portion.

Female: protarsi, segment 5 >> (2-3=4>1) in length, claw with strongly developed spine underneath in about middle. Front section of sternal carina flat. Groove on prosternal pillar deeper than in male. Labial palpi stout.

Male: protarsi as in Fig. 14, segments 1-4 same length, short, progressively more expanded, segment 5 (twice length of other segments combined and with thin projection along front edge about half width of rest of segment [segment 5 >> (1-2-3-4) in length]). Claws considerably enlarged, outer about 1/2 again length of inner. Maxillary palpi with apex of second segment weakly expanded and flat, labial palpi expanded, much stouter than in female. Genitalia broad, tip of paramere curved, terminating in small sharp spines, aedeagus relatively thick and short, spermathecal duct opening a little below tip.

Types

Holotype: ♂ 'Papua 9 ml. NE. by N. of Port Moresby. 9°22'S 147°13'E, 23.viii.1970, Key and Balderson, (Key's field notes; Trip 167, stop 21050.8). At light', in ANIC. Paratypes: 2, ♀ 'New Guinea, Port Moresby (Mt. Lawes, 1300 ft.), 5.3-12.5.1963. W.W. Brandt,' in ANIC.

Distribution

New Guinea; known only from the type localities and Amboin (in ANIC and CW).

Remarks

The large size, relatively short, broad male genitalia with hooked tips to parameres, robust metafemur, and small amount of pilosity on first abdominal segment, ally *H. novaeguineae* to *H. macronyx*. It is separated from that species by the much less elaborate male protarsi, thickened labial palpi and the spine on the underside of the protarsal claws in the female being towards the middle of the claw rather than at the base.

Hydrophilus pedipalpus (Bedel 1891) comb. nov.

Stethoxus pedipalpus Bedel, 1891, p. 317; Kuwert, 1893, p. 87; Regimbari, 1902, p. 210. *Hydrous pedipalpus* (Bedel), Knisch, 1924, p. 250.

Description (number examined 72)

Length 35-46 mm. Elongate oval. Black, appendages of head, and round patches at sides of abdominal segments dark-reddish. Head with clypeus deeply emarginate but for a relatively short distance (deepest point 1/2 width of clypeus). Exposed portion dark reddish in hind half, 60-80 large punctures on frons, densely covered with very small but variably sized punctures. Pronotum punctured as on head, with a distinct groove around lateral

edge, except hind $\frac{1}{3}$ th, virtually absent from front margin, with scattered large punctures towards sides. Elytron punctured as on head with four longitudinal rows of scattered weakly-impressed large punctures, these are flanked on each side by a row of very small punctures, distinct towards extreme apex but over much of elytron virtually lacking and only visible in certain lights, not lying in grooves except extremely weak ones at extreme apex. Apex of elytron weakly truncated with small blunt spine. Sternal carina swollen, constricted between mesocoxae, weakly grooved in hind portion, broadly and quite deeply grooved in front portion. Spine short, blunt, reaching to about halfway across 1st abdominal segment. Posternal pillar sharply pointed, groove for reception of sternal carina relatively shallow, reaching less than halfway into pillar on top edge. Lateral plate of mesosternum short, relatively broad. Metafemur quite broad, a little wider than 2nd abdominal segment. Metacoxal plate narrow, narrower than metafemur. Pilose portion of 1st abdominal segment covering well over $\frac{1}{2}$ width that segment, that on sides of other abdominal segments about $\frac{1}{3}$ width of segment. Abdominal segments 1-4 roofed in midline. Groove around edge of apical abdominal segment lacking in apical $\frac{1}{3}$ - $\frac{1}{2}$.

Female: protarsi not expanded [segment $5 < < (2 > 3 > 4 > 1)$ in length]. Front portion of sternal groove flat, groove on prosternal pillar deeper than in male.

Male: protarsi as in Fig. 13. Segments 5 and 4 and portion of 3 enlarged, particularly on outer bottom edge [segment $5 < < (2 = 3 = 4 > 1)$ in length], claws elongate, strongly curved at base, subequal in length, inner stouter than outer. Maxillary palpi with first segment expanded particularly in apical $\frac{1}{2}$ where it is deeply excavated below, apical segment short and stout. Labial palpi with first segment expanded. Genitalia with paramere tips broad and flat, aedeagus relatively thick, spermathecal duct opening below middle.

Type

A male labelled 'Australia E. Deipolle/Pedipalpus Bed', in MNHP. Since it is unclear whether this is a holotype or syntype, I hereby designate it lectotype.

Distribution (Fig. 21)

Coastal eastern Australia from Victoria northwards. A more northern species than the quite similar *H. latipalpus*. These species occur sympatrically on the south coast of New South Wales. *H. pedipalpus* differs from *H. latipalpus* by the weaker development of elytral striae, by the flat anterior portion of the sternal keel in both sexes and the strongly expanded maxillary and labial palps in the male.

Additional Localities

QLD. — Atherton, Biggenden ANIC, Brisbane AM, Edungalba ANIC, Julatten AM, Proserpine ANIC WAM, Rockhampton BMNH, Surfers Paradise ANIC QDPI, Yeppoon ANIC. N.S.W. — Alstonville AM, Armidale ANIC, Casino ANIC, Cessnock AM, Clarence R. BMNH, Evans Head ANIC, Fairfield BMNH, Kempsey SAMA, Macleay R. ANIC, Maitland ANIC, Pt Macquarie AM, Roseville AM, Tamarong AM, Terrigal ANIC, Tyndock AM, Wang Wauk AM, Wauchope AM.

Hydrophilus latipalpus Castelnau

Hydrophilus latipalpus Castelnau, 1840, p. 51. *Stethoxus latipalpus* (Castelnau), Bedel, 1891, p. 317; Regimbart, 1902, p. 209. *Hydrous latipalpus* (Castelnau), Kuwert, 1893, p. 87; Knisch, 1924, p. 249.

Description (number examined 121)

Length 30-41 mm. Oval. Black, patches at sides of abdominal segments and appendages of head lighter. Head with clypeus deeply emarginate, 100-120 large punctures in frons area, densely covered with small punctures of two sizes, the smaller sizes predominating. Pronotum punctured as on head, with a distinct groove around lateral edge except hind $\frac{1}{3}$, and for a short distance along front margin, with numerous large punctures inwards of groove in front angles. Elytron punctured as on head with four longitudinal rows of scattered large punctures, these are flanked on each side by well marked rows of scattered small punctures which, except on disc, and particularly towards apex, lie in shallow grooves. Apex of elytron bluntly rounded. Sternal carina thin, flat except for well-marked groove in midline toward rear, spine short, sharply pointed, reaching to about base of 2nd abdominal segment. Prosternal pillar sharply pointed, groove for sternal carina deep. Lateral plate of mesosternum short, relatively broad. Metatibia quite broad, about as wide as 2nd abdominal segment. Metacoxal plate narrow, narrower than metatibia. Pilose portion of 1st abdominal segment covering a bit more than half of segment, that on sides of other abdominal segments reaching a little under half way across segment. Abdominal segments 1-4 quite strongly ridged in midline. Groove around edge of apical abdominal segment lacking from apical $\frac{1}{3}$.

Female: protarsi not expanded [segment $5 < < (2 > 3 > = 4 > 1)$ in length], claws elongate each with a basal tooth. Front edge of sternal carina projecting downwards to a variable degree.

Male: protarsi as in Fig. 15, moderately expanded, claws subequal, bent, flattened with small expanded lobe at base [segment $5 < < (2 > 3 = 4 = 1)$ in length]. Maxillary palpi with apical half of second

segment greatly expanded, hollow beneath, apical segment a little expanded below apex.

Type

Not located. Type locality given as New-Holland.

Distribution (Fig. 17)

South-eastern and south-western Australia and Tasmania.

Remarks

The commonest of the large *Hydrophilus* in Australia, readily separated from *H. pedipalpus* (and *H. australis* from New Caledonia) by the downward lump at the front of the sternal carina in the female, and the moderately expanded male maxillary palpi and by the stronger development of the elytral striae.

Additional Localities

N.S.W. — Araluen ANIC, Leeton AM, Paroo R. BMNH, Nowra BMNH, Strathfield AM, Sydney AM. VIC. — ANIC, Dimboola SAMA, Grampians SAMA, Hattah Lakes ANIC, Hazelwood ANIC, Latrobe Valley NMV, Little Desert ANIC, Mel-

bourne BMNH, Morwell NMV, Orway Ra. SAMA, Ouyen ANIC, Strathfield NMV, Stawell NMV, Swan Hill ANIC, Wyperfield Nat. Pk ANIC. S.A. — Adelaide SAMA, Bool Lagoon SAMA, Cape Jaffa SAMA, Coorong SAMA, Furner SAMA, Glencoe SAMA, Kingscote (K.I.) AM, Kingston SAMA, Mt Scott SAMA, Naracoorte AM, Penola SAMA, Taratap Str SAMA. W.A. — Midland WAM, Morgers Lake WAM, Mt Arid ANIC, Perth WAM, Swan R. SAMA, Wilga ANIC. TAS. — Freycinet Nat. Pk ANIC, Launceston SAMA, Longford ANIC, Swansea ANIC, Tasmania SAMA.

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